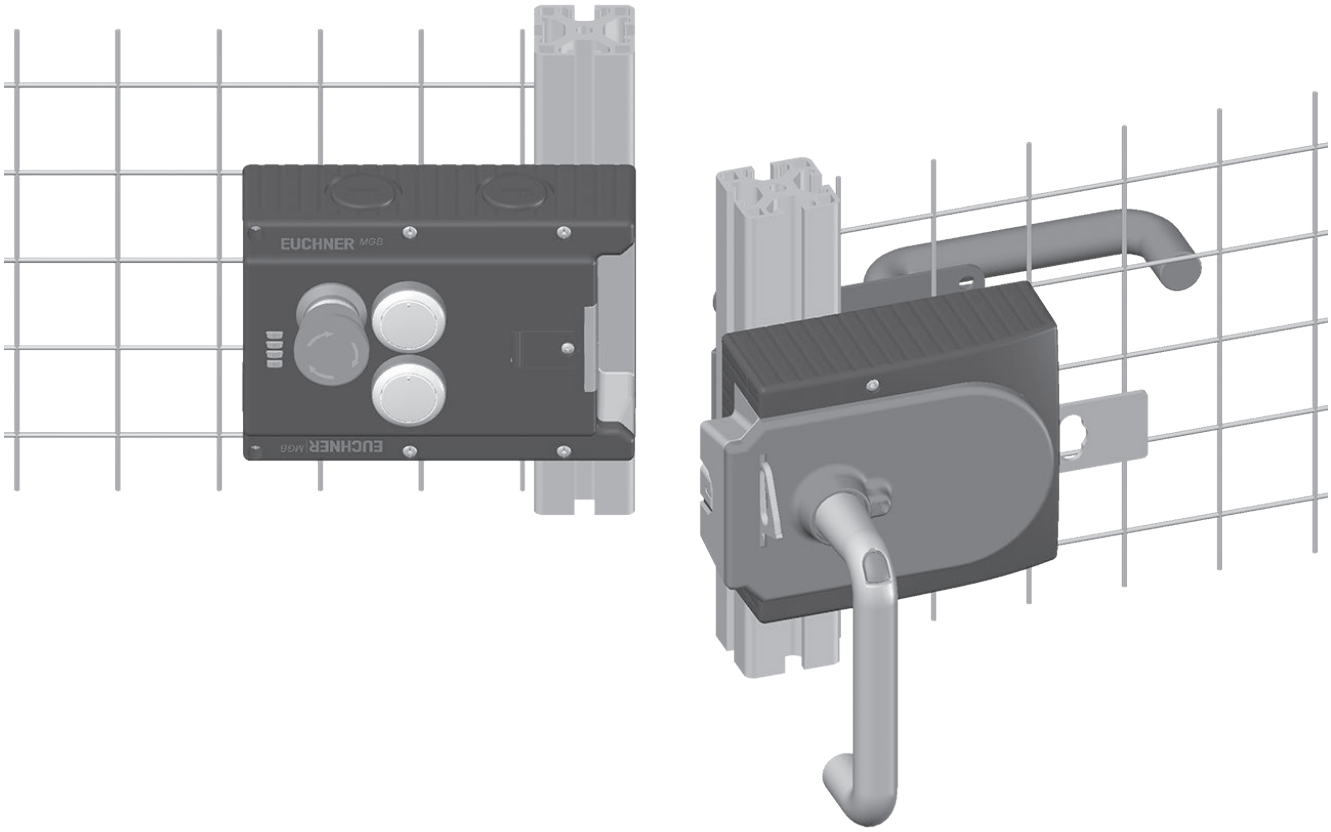
EUCHNER

Operating Instructions



Safety Systems

MGB-L0…-AR.-…
MGB-L0…-AP.-…
from V3.0.0

EN

Contents

1. About this document 4
1.1. Scope 4
1.1.1. Notes on older product versions 4
1.2. Target group 4
1.3. Key to symbols 4
1.4. Supplementary documents 5

2. Correct use 6
2.1. Main differences between MGB-AP and MGB-AR 7

3. Description of the safety function 8

4. Exclusion of liability and warranty 9

5. General safety instructions 9

6. Function 10

7. System overview 11
7.1. Interlocking module MGB-L0-... 11
7.2. Handle module MGB-H-... 11
7.3. Escape release MGB-E-... (optional) 11
7.4. Dimension drawing 12
7.5. Lockout mechanism 13
7.6. Escape release (optional) 14
7.6.1. Preparing escape release 14

8. Mounting 16
8.1. Mounting color cover 17

9. Changing actuating direction (here: from right to left) 19

10. Protection against environmental effects 20

11. Electrical connection 21
11.1. Notes about cULus 22
11.2. Safety in case of faults 22
11.3. Fuse protection for power supply 22
11.4. Requirements for connection cables 23
11.5. Notes on cable laying 23
11.6. Changing device configuration (using DIP switches) 24
11.6.1. Changing system family (AR/AP switching) 24
11.7. Notes on operation with control systems 25
11.8. Terminal assignment and contact description 26
11.9. Operation as separate device 27

11.10. Operation in an AR switch chain 28
11.11. Notes on operation in an AR switch chain 29
11.11.1. System times 29
11.11.2. Wiring an AR switch chain 29
11.11.3. Number of devices in the switch chains 29
11.11.4. Resetting in switch chains 29
12. Setup 30
12.1. Teach-in operation (only for MGB unicode) 30
12.2. Mechanical function test 30
12.3. Electrical function test 31
13. Technical data 32
13.1. Typical system times 33
14. System states 33
14.1. Key to symbols 33
14.2. MGB-AR system status table 34
14.3. MGB-AP system status table 35
15. Troubleshooting and assistance 36
15.1. Fault reset 36
15.2. Help on troubleshooting in the Internet 36
15.3. Help on mounting in the Internet 36
15.4. Application examples 36
16. Service 36
17. Inspection and service 37
18. Declaration of conformity 38

EN

1. About this document

1.1. Scope

These operating instructions are valid for all MGB-L0…-AR.-… and MGB-L0…-AP.-…. These operating instructions, the document “Safety information and maintenance” and any enclosed data sheet form the complete user information for your device.

Series	Version	System families	Product versions
MGB	L0 (without guard locking)	…-AP…	from V3.0.0
		…-AR…	

1.1.1. Notes on older product versions

Products with lower product versions or without a version number are not described by these operating instructions. Please contact our support team in this case.

1.2. Target group

Design engineers and installation planners for safety devices on machines, as well as setup and servicing staff possessing special expertise in handling safety components

1.3. Key to symbols

Symbol/depiction	Significance
AP	This section applies on operation as MGB-AP
AR	This section applies on operation as MGB-AR
DIP	In this section attention must be paid to the DIP switch setting
	Printed document
www	Document is available for download at www.euchner.de
	Document on CD
DANGER **WARNING** **CAUTION**	Safety precautions **Danger** of death or severe injuries **Warning** about possible injuries **Caution** Slight injuries possible
NOTICE **Important!**	**Notice** about possible device damage **Important** information
Tip	Tip/useful information

1.4. Supplementary documents

The overall documentation for this device consists of the following documents:

Document title (document number)	Contents	
Safety information and maintenance for safety system MGB-AR/MGB-AP from V3.0.0 (123151)	Basic information about safe setup and maintenance	
Operating instructions (112657)	(this document)	
Possibly enclosed data sheet	Item-specific information about deviations or additions	
Brief instructions for teach-in operation – MGB-AP/ MGB-AR (from V2.0.0) (114903)	Brief instructions for teach-in operation	

Important!

Always read all documents to gain a complete overview of safe installation, setup and use of the device. The documents can be downloaded from www.euchner.de. Enter the document number in the search box for this purpose.

EN

2. Correct use

The system comprises at least one interlocking module MGB-L0-... and one handle module MGB-H...

The safety system MGB is an interlocking device without guard locking (type 4). Devices with unicode evaluation possess a high coding level; devices with multicode evaluation feature a low coding level.

The interlocking module can be configured with the aid of DIP switches. Depending on the setting, the interlocking module behaves like an AP or AR device (see chapter *2.1. Main differences between MGB-AP and MGB-AR on page 7*). More detailed information about the possible settings is available in the chapter *11.6. Changing device configuration (using DIP switches) on page 24*.

In combination with a movable safety guard and the machine control, this safety component prevents dangerous machine functions from occurring while the safety guard is open. A stop command is triggered if the safety guard is opened during the dangerous machine function.

This means:

- Starting commands that cause a dangerous machine function must become active only when the safety guard is closed.
- Opening the safety guard triggers a stop command.
- Closing a safety guard must not cause automatic starting of a dangerous machine function. A separate start command must be issued. For exceptions, refer to EN ISO 12100 or relevant C-standards.

Before the device is used, a risk assessment must be performed on the machine, e.g. in accordance with the following standards:

- EN ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- EN ISO 12100, Safety of machinery – General principles for design – Risk assessment and risk reduction
- IEC 62061, Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems

Correct use includes observing the relevant requirements for installation and operation, particularly based on the following standards:

- EN ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- EN ISO 14119 (supersedes EN 1088), Safety of machinery – Interlocking devices associated with guards – Principles for design and selection
- EN 60204-1, Safety of machinery – Electrical equipment of machines – Part 1: General requirements

The safety system MGB can only be combined with the intended modules in the MGB system family.

On the modification of system components, EUCHNER provides no warranty for function.

AR

Interlocking modules with the configuration MGB-AR can be integrated into an AR switch chain.

Connection of several devices in an AR switch chain is permitted only using devices intended for series connection in an AR switch chain. Check the operating instructions for the related device.

Important!

- The user is responsible for the proper integration of the device into a safe overall system. For this purpose, the overall system must be validated, e.g. in accordance with EN ISO 13849-2.
- Correct use requires observing the permissible operating parameters (see chapter *13. Technical data on page 32*).
- If a product data sheet is included with the product, the information on the data sheet applies.

Table 1: Possible combinations for MGB components

Evaluation unit	Handle module
	MGB-H-... from V2.0.0
MGB...AR/AP from V3.0.0	●

Key to symbols	●	Combination possible

2.1. Main differences between MGB-AP and MGB-AR

System family	Symbol	Use
MGB-AP		Optimized for operation in safe control systems. If series connection is not necessary, the number of terminals can be reduced using this system family.
MGB-AR		Linking of several safety guards on one shutdown path. As a consequence several safety doors can be very simply polled using one evaluation unit or two control system inputs.

EN

3. Description of the safety function

Devices from this series feature the following safety functions:

**Monitoring of the safety guard position
(interlocking device according to EN ISO 14119)**

- Safety function: The safety outputs are switched off when the safety guard is open (see chapter *6. Function on page 10*).
- Safety characteristics: category, Performance Level, PFH_d (see chapter *13. Technical data on page 32*).

The following applies to devices with emergency stop:

**Emergency stop
(emergency stop device according to EN ISO 13850)**

- Safety function: emergency stop function
- Safety characteristics: B_{10d} value (see chapter *13. Technical data on page 32*)

4. Exclusion of liability and warranty

In case of failure to comply with the conditions for correct use stated above, or if the safety instructions are not followed, or if any servicing is not performed as required, liability will be excluded and the warranty void.

5. General safety instructions

Safety switches fulfill personal protection functions. Incorrect installation or tampering can lead to fatal injuries to personnel.

Check the safe function of the safety guard particularly

- after any setup work
- after the replacement of an MGB component
- after an extended period without use
- after every fault
- after any change to the DIP switch setting

Independent of these checks, the safe function of the safety guard should be checked at suitable intervals as part of the maintenance schedule.

WARNING

Danger to life due to improper installation or due to bypassing (tampering). Safety components perform a personal protection function.

- Safety components must not be bypassed, turned away, removed or otherwise rendered ineffective. On this topic pay attention in particular to the measures for reducing the possibility of bypassing according to EN ISO 14119:2013, section 7.
- The switching operation is only allowed to be triggered by the intended handle module MGB-H… that is positively fastened to the safety guard.
- Prevent bypassing by means of replacement actuators (only for multicode evaluation). For this purpose, restrict access to actuators and to keys for releases, for example.
- Mounting, electrical connection and setup only by authorized personnel possessing the following knowledge:
  - specialist knowledge in handling safety components
  - knowledge about the applicable EMC regulations
  - knowledge about the applicable regulations on occupational safety and accident prevention.

Important!

Prior to use, read the operating instructions and keep these in a safe place. Ensure the operating instructions are always available during mounting, setup and servicing. EUCHNER cannot provide any warranty in relation to the readability of the CD for the storage period required. For this reason you should archive a printed copy of the operating instructions. You can download the operating instructions from www.euchner.de.

EN

6. Function

Together with a handle module, the interlocking module makes it possible to monitor the position of moving safety guards. The combination also serves as a mechanical door stop at the same time.

DIP

The following switch-on condition applies to the safety outputs FO1A and FO1B (also see chapters *14.2. MGB-AR system status table on page 34* and *14.3. MGB-AP system status table on page 35*):

Configuration → System family		MGB-AR	MGB-AP
Condition	No fault in the device	TRUE	TRUE
	Safety guard closed	TRUE	TRUE
	Bolt tongue inserted in interlocking module	TRUE	TRUE
	In case of series connection: Signal available from the upstream switch on the safety inputs FI1A and FI1B **In case of separate operation:** DC 24 V present at the safety inputs FI1A and FI1B	TRUE	irrelevant
		↓ FO1A and FO1B are **ON**	

The interlocking module detects the position of the safety guard and the position of the bolt tongue.

The bolt tongue in the handle module is moved into and out of the interlocking module by actuating the door handle.

7. System overview

7.1. Interlocking module MGB-L0-...

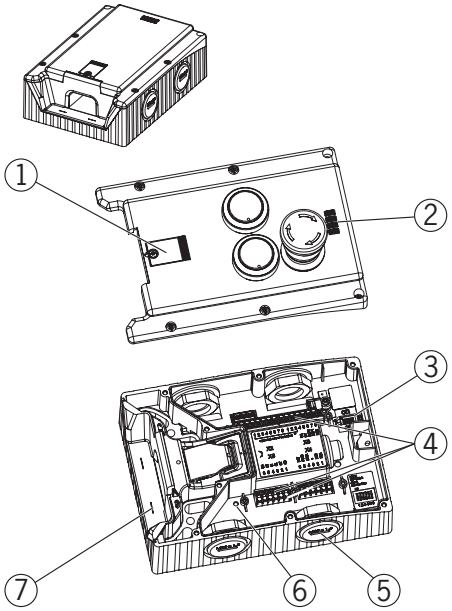


Figure 1: Interlocking module MGB-L.–...

Key:
① Cover for mechanical release
② LED indicator
③ DIP switches
④ Terminals X2-X5
⑤ Depending on version
Cable entry M20x1.5 or plug connector
⑥ Internal reset
⑦ Auxiliary marking for maximum permitted mounting distance

Notice:
Depending on the version, additional controls and indicators may be integrated into the cover and a mounting plate can be included.
See enclosed data sheet.

7.2. Handle module MGB-H-...

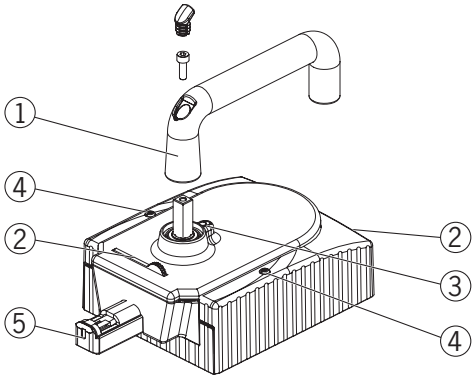


Figure 2: Handle module MGB-H-...

Key:
① Door handle
② Fold-out lockout mechanism
(optional: second, automatically extending lockout mechanism)
③ Locking pin for handle adjustment
④ Locking screws T10 for housing cover
⑤ Bolt tongue

Notice:
Depending on the version, a mounting plate can be included.
See enclosed data sheet.

7.3. Escape release MGB-E-... (optional)

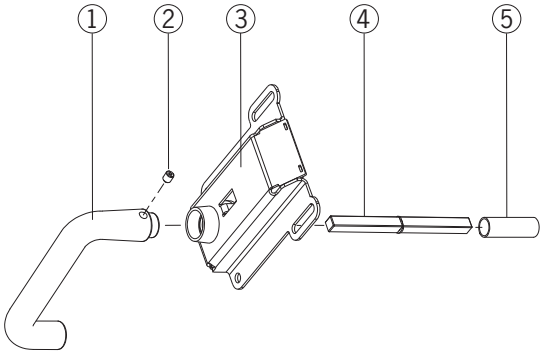


Figure 3: Escape release MGB-E-...

Key:
① Door handle
② Setscrew
③ Cover
④ Actuation axis 8 x 8 mm
(different lengths available)
⑤ Protective sleeve

Notice:
Depending on the version, a mounting plate can be included.
See enclosed data sheet.

EN

7.4. Dimension drawing

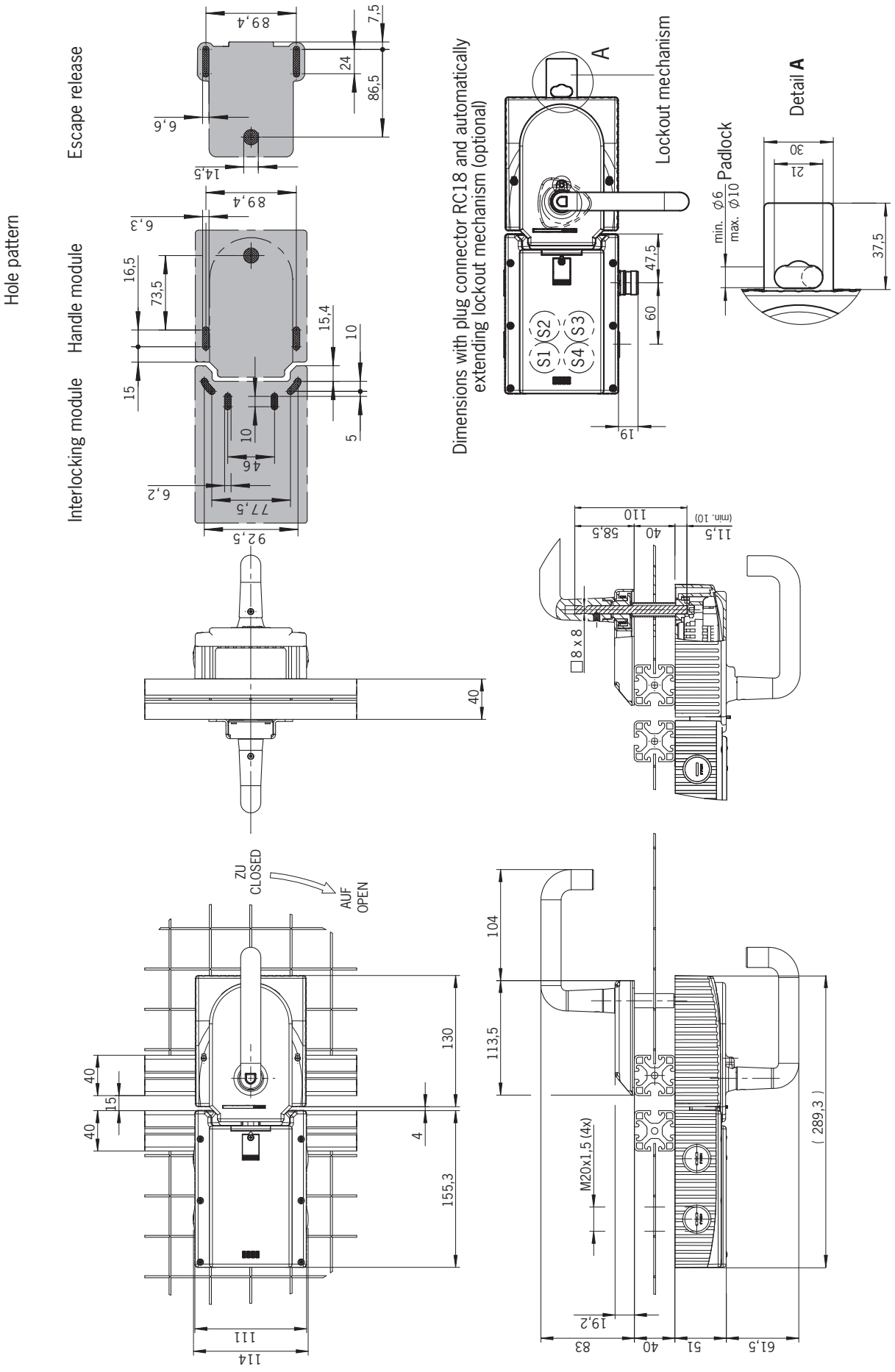
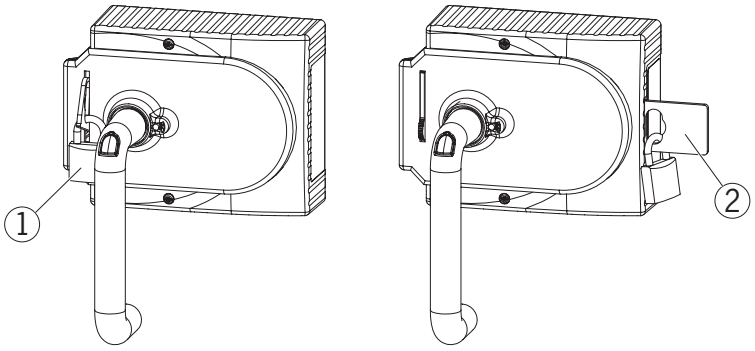


Figure 4: Dimension drawing – MGB mounted, without optional mounting plates

7.5. Lockout mechanism

If the lockout mechanism is pivoted out/extended, the bolt tongue cannot be extended. The lockout mechanism can be secured with padlocks (see *Figure 5*).

➡ To pivot out, press the grooved part (only possible with bolt tongue retracted).



Key:
① Padlock ∅ min. 2 mm, ∅ max. 10 mm
Notice:
You can fit a maximum of 3 locks Ø 8 mm.

② Automatically extending, second lockout mechanism
Padlock ∅ min. 6 mm, ∅ max. 10 mm

Figure 5: Lockout mechanism secured with padlock

EN

7.6. Escape release (optional)

The escape release is used to open a safety guard from the inside without tools.

Important!

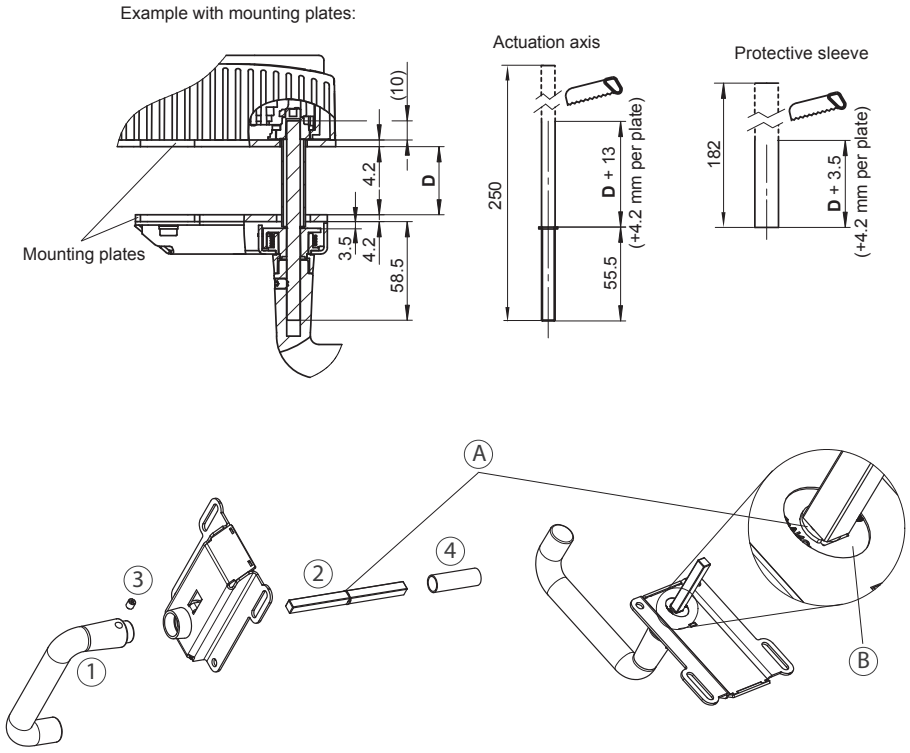
- It must be possible to operate the escape release manually from inside the protected area without tools.
- It must not be possible to reach the escape release from the outside.
- The actuator must not be under tensile stress during manual release.
- The escape release meets the requirements of Category B according to EN ISO 13849-1:2008.

- Fit escape release such that operation, inspection and service are possible.
- The actuation axis for the escape release must be inserted min. 10 mm into the handle module. Note the information on the different profile widths in the next chapter.
- Align escape release axis at right angles to the handle module. See *Figure 4* and *Figure 7*.

7.6.1. Preparing escape release

(also see *Figure 6: Preparing escape release on page 15*)

Profile width	Length required for actuation axis		Which EUCHNER parts are required?	Necessary work steps
	Without plates	With mounting plates (4 mm each)		
D	D+13	D+21		
30 mm	43 mm	51 mm	Standard escape release with 110 mm axis (order no. 100465)	Shorten to required length
40 mm	53 mm	61 mm	Standard escape release with 110 mm axis (order no. 100465) If necessary extended actuation axis (order no. 106761)	*Without mounting plates:* None *With mounting plates:* Use long actuation axis and protective sleeve and shorten to required length
45 mm	58 mm	66 mm	Standard escape release with 110 mm axis (order no. 100465) **and** extended actuation axis (order no. 106761)	Use long actuation axis and protective sleeve and shorten to required length
50 mm	63 mm	71 mm	Standard escape release with 110 mm axis (order no. 100465) **and** extended actuation axis (order no. 106761)	Use long actuation axis and protective sleeve and shorten to required length



① Fit door handle.
② Insert actuation axis. The locking ring **A** must be in contact with the escape release **B**.
③ Tighten setscrew to 2 Nm.
④ Fit protective sleeve.

Figure 6: Preparing escape release

EN

8. Mounting

WARNING

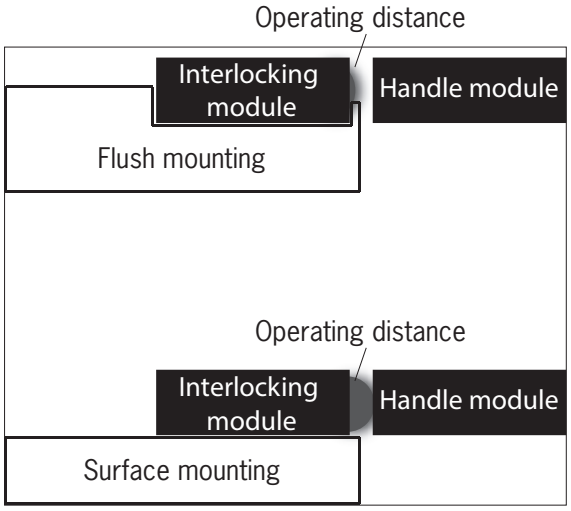
Mounting must be performed only by authorized personnel.

With two-wing hinged doors, one of the two door wings additionally must be latched mechanically.

Use a rod latch (Item) or a double-door lock (Bosch Rexroth) for this purpose, for example.

Important!

- If installed flush, the switching distance changes as a function of the installation depth and the safety guard material.



Tip!

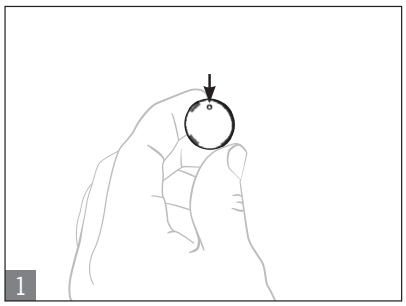
- You will find an animation on the mounting process at www.euchner.de.
- The color and labeling of pushbuttons and indicators can be modified.

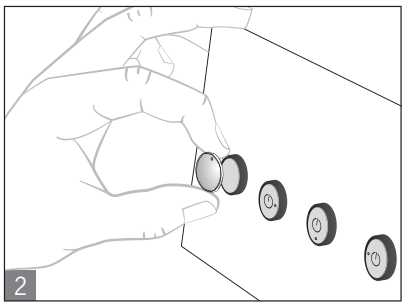
For mounting steps, see *Figure 7* and *Figure 8* to *Figure 13*.

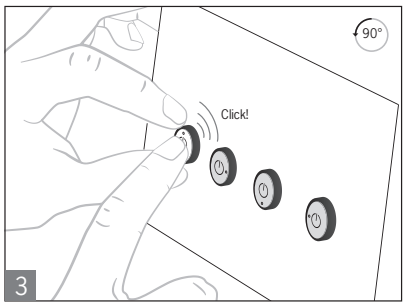
Install system so that inspection and maintenance are possible.

8.1. Mounting color cover

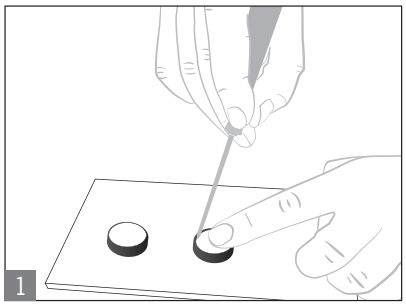
Mounting

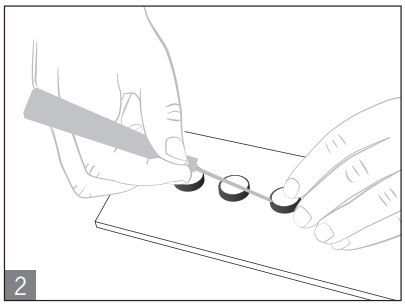






Removing





Color cover

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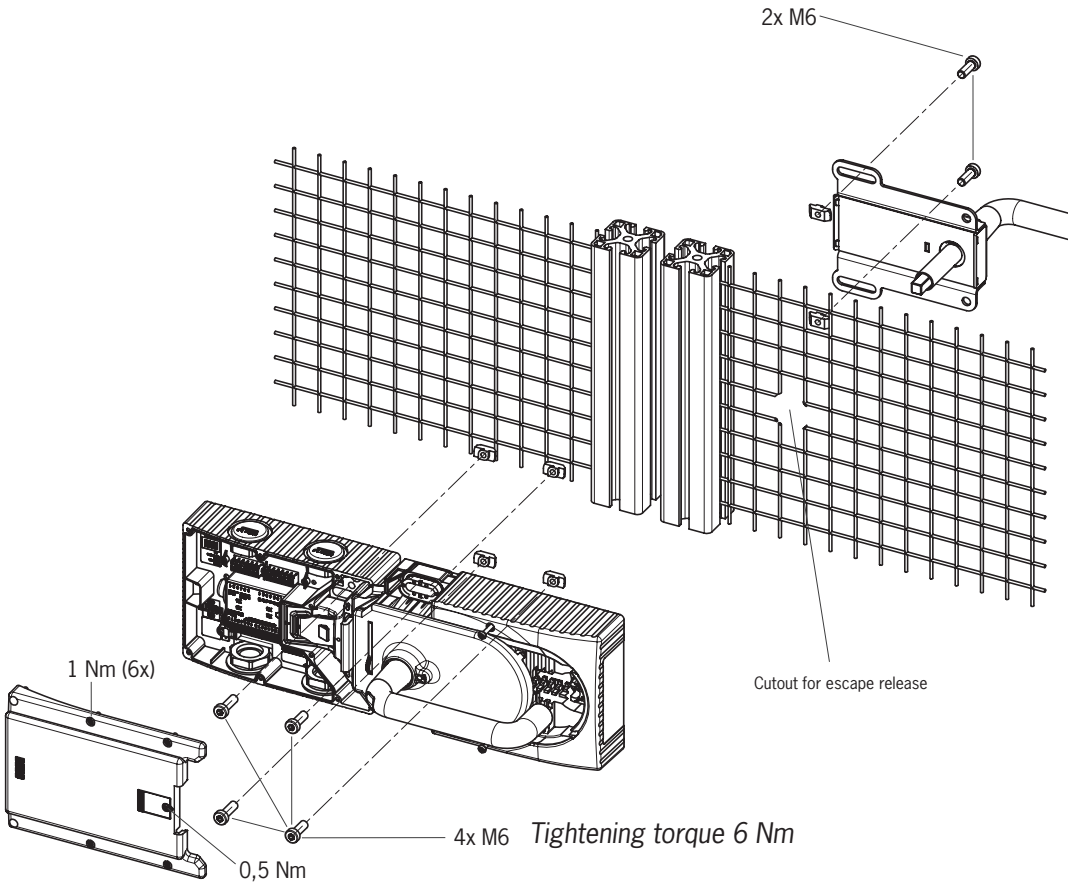


Recommended fixing material:
For mounting on the mounting plate:
DIN 912-M6X25-8.8 ZN CYLINDER HEAD SCREW

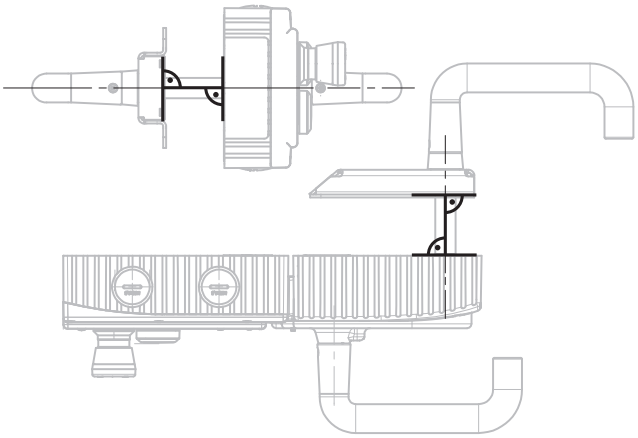


Figure 7: Installation example for door hinged on the right (general view)

9. Changing actuating direction (here: from right to left)

Important!

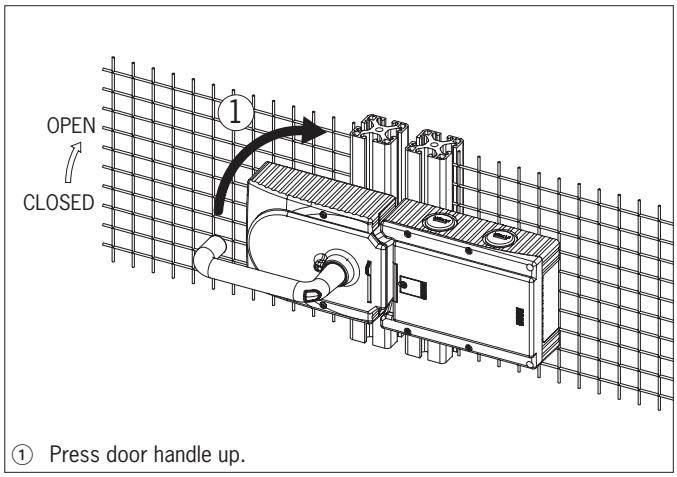
It is only possible to make this change when the bolt tongue is not extended and an escape release is not yet mounted.

As supplied, the handle module is set either for doors hinged on the right or for doors hinged on the left.

Based on the example of a handle module for doors hinged on the right this means:

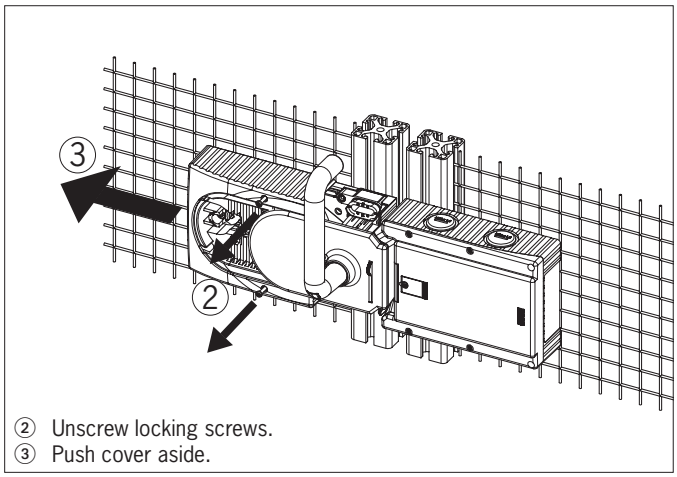
- The safety guard opens by pressing down the door handle.
- The system is mounted the other way around for doors hinged on the left. In other words, the safety door opens by pressing up the door handle (see *Figure 8*). For this reason the actuating direction of the door handle must be changed (see *Figure 8* to *Figure 13*).

(similarly on handle modules for doors hinged on the left)



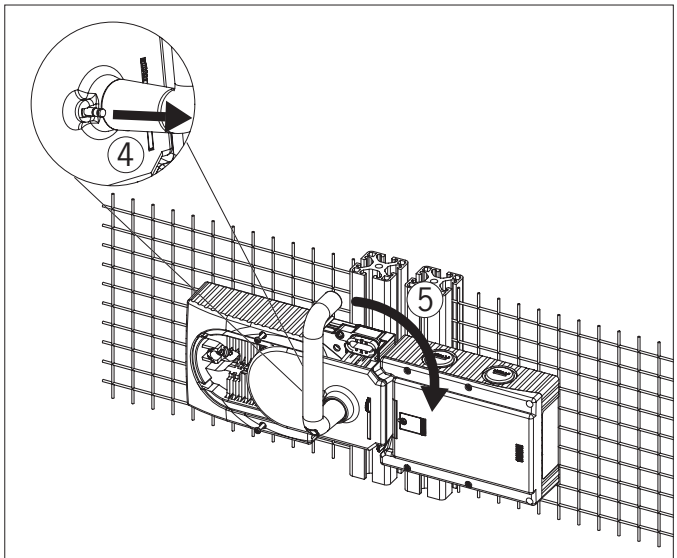
① Press door handle up.

Figure 8: Changing actuating direction, step ①



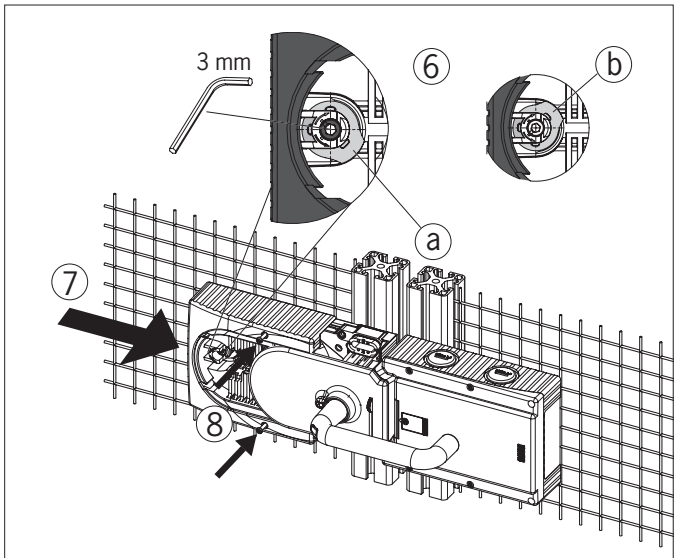
② Unscrew locking screws.
③ Push cover aside.

Figure 9: Changing actuating direction, steps ② and ③



④ Lift the locking pin on the door handle using a screwdriver and hold it in this position.
⑤ Turn door handle to the right.

Figure 10: Changing actuating direction, steps ④ and ⑤



⑥ Only if using an escape release: using the hexagon head screw, turn the joint counterclockwise from position (a) to position (b).
⑦ Close cover.
⑧ Screw in locking screws and tighten to 0.8 Nm.

Figure 11: Changing actuating direction, steps ⑥ to ⑧

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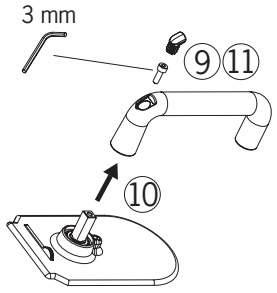
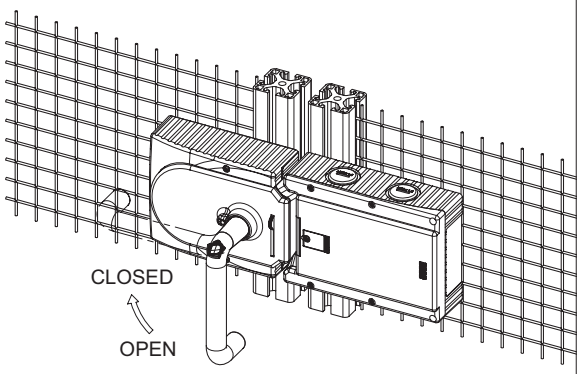


⑨ Remove cover and undo hexagon socket screw.
⑩ Reposition the door handle by 90° in clockwise direction and fasten it again.
⑪ Tighten hexagon socket head screw to 3 Nm.

Figure 12: Changing actuating direction, steps ⑨ and ⑪



⑫ State after repositioning.

Figure 13: Changing actuating direction, final state

10. Protection against environmental effects

Lasting and correct safety function requires that the system must be protected against foreign bodies such as swarf, sand, blasting shot, etc., which can become lodged in the interlocking and handle modules. For this purpose a suitable installation position should be selected.

Cover device during painting work!

11. Electrical connection

WARNING

In case of an error, loss of the safety function through incorrect connection.

- To ensure safety, both safety outputs (FO1A and FO1B) must always be evaluated.
- The monitoring outputs must not be used as safety outputs.
- Lay the connection cables with protection to prevent the risk of short circuits.

CAUTION

Risk of damage to equipment or malfunctions as a result of incorrect connection.

- The inputs on an evaluation unit connected must be positive-switching, as the two outputs on the safety switch deliver a level of +24 V in the switched-on state.
- All the electrical connections must either be isolated from the mains supply by a safety transformer according EN IEC 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.
- All electrical outputs must have an adequate protective circuit for inductive loads. The outputs must be protected with a free-wheeling diode for this purpose. RC interference suppression units must not be used.
- Power devices which are a powerful source of interference must be installed in a separate location away from the input and output circuits for signal processing. The cable routing for safety circuits should be as far away as possible from the cables of the power circuits.
- To prevent EMC problems, it is imperative you follow the chapter *11.5. Notes on cable laying on page 23*. Follow EMC notes on devices in the immediate vicinity of the MGB system and their cables.
- In order to avoid EMC interference, the physical environmental and operating conditions at the installation site of the device must comply with the requirements according to the standard DIN EN 60204-1:2006, section 4.4.2/EMC.

Important!

- If the device does not appear to function when the operating voltage is applied (e.g. green Power LED does not illuminate), the safety switch must be returned to the manufacturer.
- To ensure the stated degree of protection is achieved, the cover screws must be tightened to a tightening torque of 1 Nm.
- Tighten screw for the cover for the mechanical release to 0.5 Nm.

EN

11.1. Notes about cULus

Important!

- For use and operation as per the cULus requirements [1], a power supply with the feature "for use in class 2 circuits" must be used. The same requirement applies to the safety outputs.
  Alternative solutions must comply with the following requirements:
  a) Electrically isolated power supply unit with a max. open-circuit voltage of 30 V/DC and a limited current of max. 8 A.
  b) Electrically isolated power supply unit in combination with fuse as per UL248. This fuse should be designed for max. 3.3 A and should be integrated into the 30 V DC voltage section.
- The mounting of conduits directly on the MGB is not allowed. Cables are only allowed to be connected via suitable cable glands. For this purpose use EUCHNER cable gland of type EKPM20/06U. Equivalent cable glands can be used if they are UL-listed (QCRV) and are suitable for the related cable diameter (22 AWG – 17 AWG).

1) Note on the scope of the UL approval: Only for applications as per NFPA 79 (Industrial Machinery).
The devices have been tested as per the requirements of UL508 (protection against electric shock and fire).

11.2. Safety in case of faults

- The operating voltage UB is reverse polarity protected.
- The safety outputs FO1A/FO1B are short circuit-proof.
- A short circuit between FI1A and FI1B or FO1A and FO1B is detected by the device.
- A short circuit in the cable can be excluded by laying the cable with protection.

11.3. Fuse protection for power supply

The power supply must be provided with fuse protection depending on the number of devices and current required for the outputs. The following rules apply:

Max. current consumption of an individual device I_{max}

I_{max} = I_{UB} + I_{UA} + $I_{FO1A+FO1B}$

I_{UB} = Device operating current (80 mA)

I_{UA} = Load current of monitoring outputs OD, OT and OI (3 x max. 50 mA) + switches

$I_{FO1A+FO1B}$ = Load current of safety outputs FO1A + FO1B (2 x max. 50 mA)

AR

Max. current consumption of a switch chain Σ I_{max}

$\Sigma I_{max} = I_{FO1A+FO1B} + n \times (I_{UB} + I_{UA})$

n = Number of connected devices

Current assignment to the fuses

Current	Fuse circuit F1	Fuse circuit F2
I_{UB}	80 mA	
$I_{FO1A+FO1B}$	(2 x max. 200 mA)	
I_{UA}		$I_{OD,OT,OI}$ = (3 x max. 50 mA) $I_{switches}$ = max. 100 mA (per switch) $I_{indicators}$ = max. 5 mA (per indicator)

11.4. Requirements for connection cables

CAUTION

Risk of damage to equipment or malfunctions as a result of incorrect connection cables.

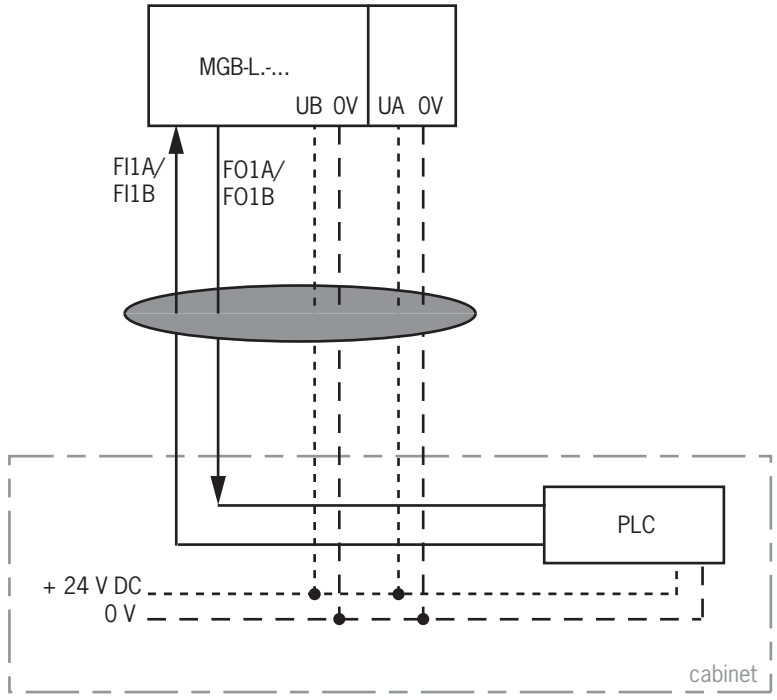
- On the usage of other connection components, the requirements in the following table apply. EUCHNER provides no warranty for safe function in case of failure to comply with these requirements.

Observe the following requirements with respect to the connection cables:

Parameter	Value	Unit
Conductor cross-section min.	0.13	mm²
R max.	60	Ω/κμ
C max.	120	nF/km
L max.	0.65	mH/km

11.5. Notes on cable laying

Lay all MGB connection cables in a common cable harness.



Important: lay cables in a common harness

Figure 14: Stipulated cable laying

EN

11.6. Changing device configuration (using DIP switches)

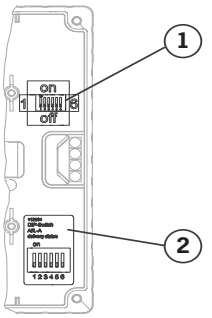
Tip!

You will find an animation on device configuration at www.euchner.de.

DIP switches

The devices can be configured using the DIP switches. The following settings are possible:

- Changing system family (AR/AP switching)



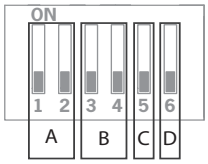
Position of the switches

Item	Description
1	DIP switches
2	Sticker with factory setting

Function of the switches

Important!

DIP switches 3, 4 and 6 must be set to “off” position.



Detail	Switch	Function
A	1+2	on: Device is operated as AP system
		off: Device is operated as AR system
B	3+4	No function
C	5	on: Configuration possible
		off: Configuration inhibited (factory setting)
D	6	No function

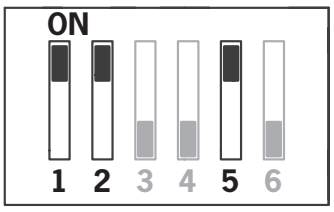
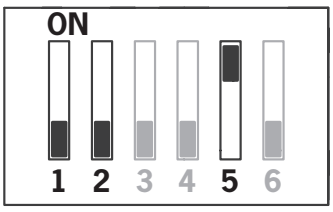
11.6.1. Changing system family (AR/AP switching)

CAUTION

Malfunction due to incorrect configuration or incorrect connection.

- Note that the terminal assignment also changes on changing the configuration (see chapter *11.8. Terminal assignment and contact description on page 26*).

1. Switch off power supply.
2. Set DIP switches 1, 2 and 5 as shown.

For changing from AR => AP	For changing from AP => AR
	

3. Switch on power supply for 5 s.

➡ The change is confirmed by the illumination of the Power LED. All other LEDs are off.

4. Switch off power supply and set DIP switch 5 to OFF.

➡ The next time the device is started, it operates in the operating mode set.

11.7. Notes on operation with control systems

Please observe the following requirements for connection to safe control systems:

General notes

- Use a common power supply for the control system and the connected safety switches.
- A pulsed power supply must not be used for UB/UA. Tap the supply voltage directly from the power supply unit. If the supply voltage is connected to a terminal of a safe control system, this output must provide sufficient electrical current.
- The safety outputs (FO1A and FO1B) can be connected to the safe inputs of a control system. Prerequisite: The input must be suitable for pulsed safety signals (OSSD signals, e.g. from light curtains). The control system must tolerate test pulses on the input signals. This normally can be set up by parameter assignment in the control system. Observe the notes of the control system manufacturer. For the pulse duration of your safety switch, please refer to the chapter *13. Technical data on page 32*.
- The inputs on an evaluation unit connected must be positive-switching, as the two outputs on the safety switch deliver a level of +24 V in the switched-on state.

AR

- Always connect inputs FI1A and FI1B directly to a power supply unit or to outputs FO1A and FO1B of another EUCHNER AR device (series connection). Pulsed signals must not be present at inputs FI1A and FI1B.
  The test pulses are also present when the safety outputs are switched off (only on FO1A). Depending on the inertia of the connected device (control system, relay, etc.), this can lead to short switching processes.

The inputs on an evaluation unit connected must be positive-switching, as the two outputs on the safety switch deliver a level of +24 V in the switched-on state.

ⓘ	**NOTICE** Due to the fact that short circuit monitoring of the safety outputs FO1A/FO1B is performed by the device itself, the Performance Level in accordance with EN 13849 is not reduced if the control system pulsing is switched off.

ⓘ	**Tip!** A detailed example of connecting and setting the parameters of the control system is available for many devices at www.euchner.de in the area Download ▸ Applications ▸ MGB. The features of the respective device are dealt with there in greater detail.

EN

11.8. Terminal assignment and contact description

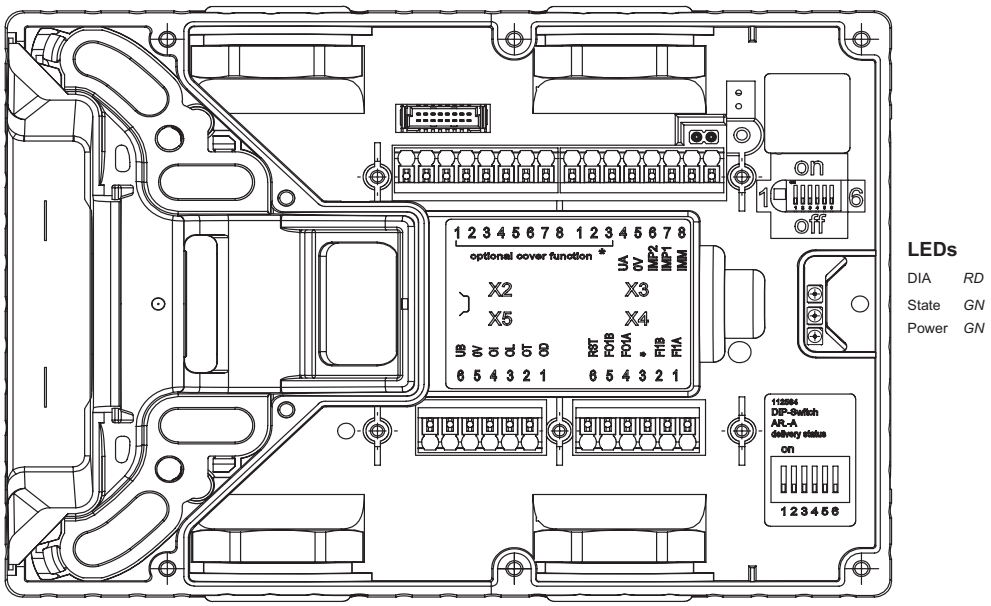


Figure 15: Connections and indicator LED

Terminal	Designation	Description
X3.1 to X3.3	-	See the enclosed data sheet
X3.4	UA	Power supply for monitoring outputs and cover assembly, DC 24 V, must be permanently present.
X3.5	0V	Ground, DC 0 V (connected internally to X5.5).
X3.6	-	Not used
X3.7	-	Not used
X3.8	-	Not used
X4.1	FI1A	***In case of AR configuration:*** Enable input for channel A, connect to DC 24 V in separate operation. In case of switch chains, connect output signal FO1A from previous device. ***In case of AP configuration:*** Input is not evaluated.
X4.2	FI1B	***In case of AR configuration:*** Enable input for channel B, connect to DC 24 V in separate operation. In case of switch chains, connect output signal FO1B from previous device. ***In case of AP configuration:*** Input is not evaluated.
X4.3	-	See the enclosed data sheet
X4.4	FO1A	Safety output channel A, ON when door is closed and bolt tongue is retracted.
X4.5	FO1B	Safety output channel B, ON when door is closed and bolt tongue is retracted.
X4.6	RST	Reset input, device is reset if DC 24 V is applied to RST for at least 3 s.
X5.1	OD	Door monitoring output, ON when the door is closed.
X5.2	OT	Bolt tongue monitoring output, ON when the door is closed and the bolt tongue is inserted in the interlocking module.
X5.3	-	Not used
X5.4	OI	Diagnostics monitoring output, ON when the device is in the fault state.
X5.5	0V	Ground, DC 0 V (connected internally to X3.5).
X5.6	UB	Power supply, DC 24 V
X2.1 to X2.8	-	See the enclosed data sheet
X1	-	Reserved for connection of the cover circuit board (only for populated covers)

Table 2: Terminal assignment and contact description

11.9. Operation as separate device

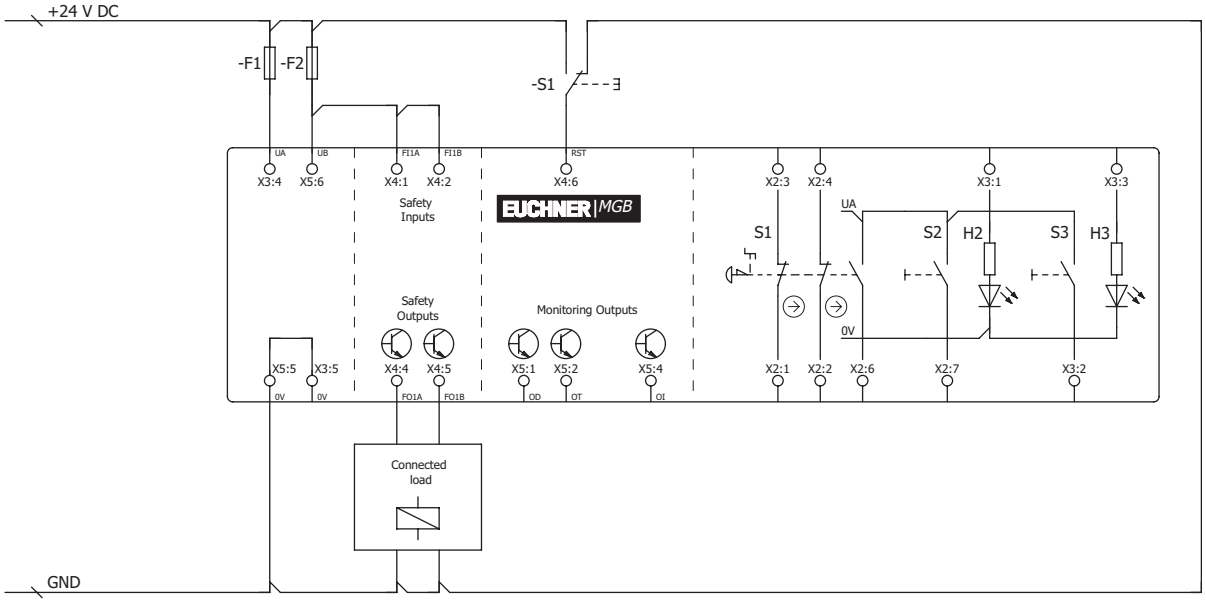


Figure 16: Connection example for separate operation

The switches can be reset via the RST input. To do this, a voltage of 24 V is applied to the RST input for at least 3 seconds. The supply voltage to the switches is interrupted during this time. The RST input must be connected to 0 V if it is not used.

EN

11.10. Operation in an AR switch chain

AR

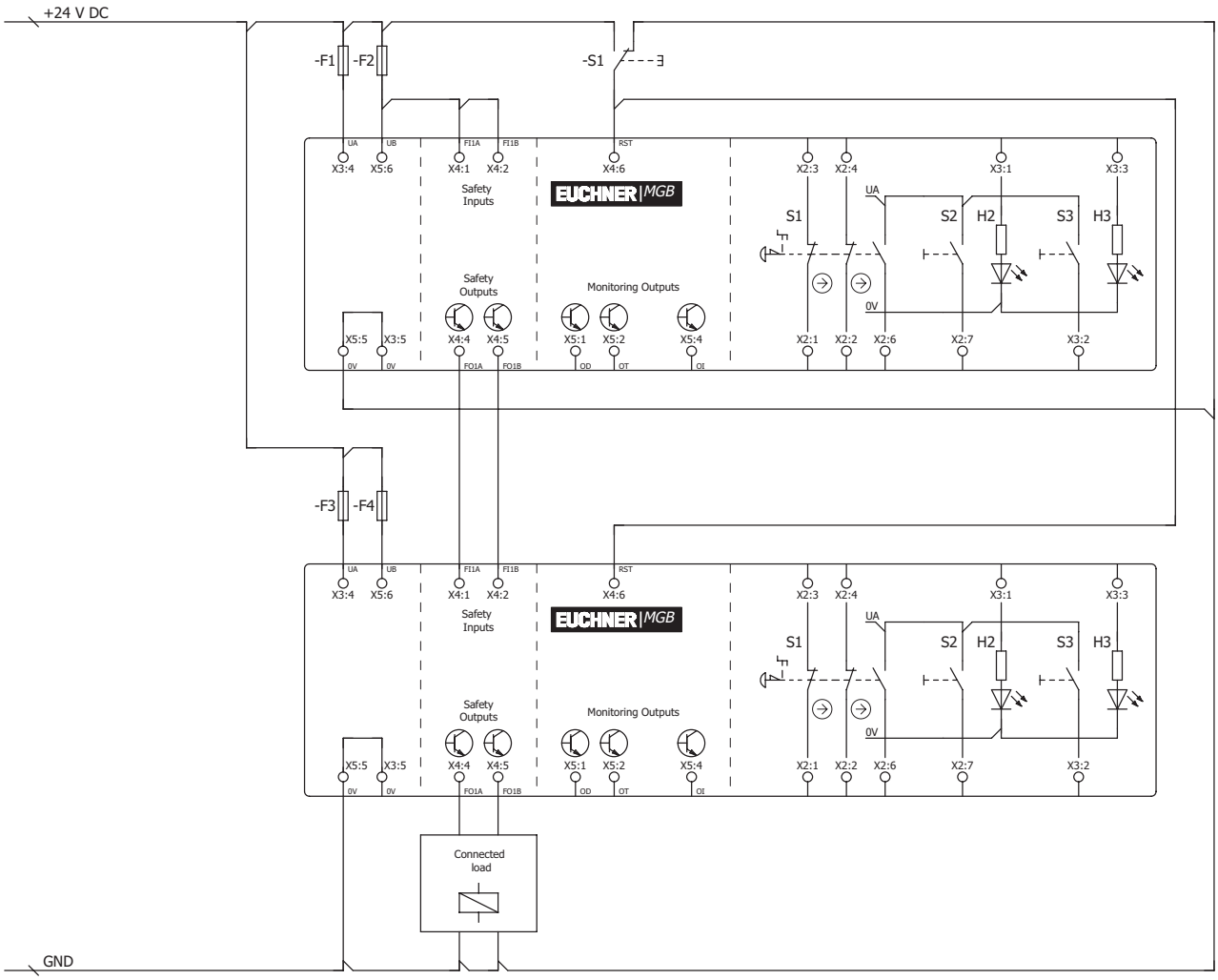


Figure 17: Connection examples for operation in a CES-AR switch chain

For detailed information on operation in an AR switch chain, see the related CES-AR operating instructions. The interlocking module MGB-L0-AR-... behaves in the switch chain in practice like a safety switch CES-AR. The differences to the CES-AR are described in the following.

11.11. Notes on operation in an AR switch chain

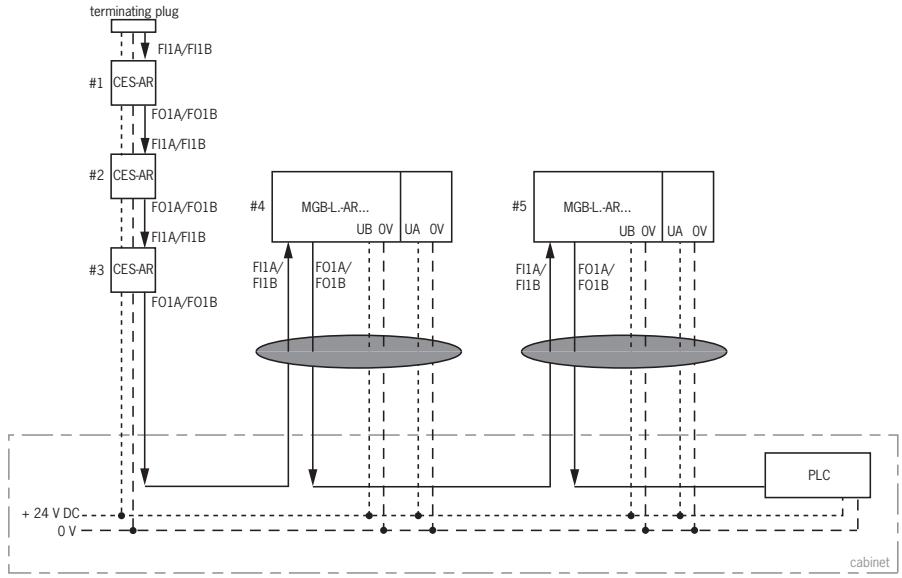
AR

11.11.1. System times

The interlocking module has longer reaction times than a CES-AR switch (see chapters *13. Technical data on page 32* and *13.1. Typical system times on page 33*).

11.11.2. Wiring an AR switch chain

To prevent earth loops, the wiring should be in a star configuration (see *Figure 18*).



Important: lay cables in a common harness

Figure 18: Central wiring of an AR switch chain in the control cabinet

11.11.3. Number of devices in the switch chains

In a pure MGB switch chain a maximum of ten devices can be connected in series. In mixed switch chains (e.g. MGB together with CES-AR) the maximum number of devices is also ten.

11.11.4. Resetting in switch chains

	Important! Use the reset input (RST) for resetting in AR switch chains. All devices in the chain must be reset simultaneously. Resetting individual switches will result in faults.

EN

12. Setup

12.1. Teach-in operation (only for MGB unicode)

The handle module must be assigned to the interlocking module using a teach-in function before the system comprising interlocking module and handle module forms a functional unit.

During a teach-in operation the safety outputs are switched off.

Important!

- The interlocking module disables the code for the previous handle module if teach-in is carried out for a new handle module. Teach-in is not possible again immediately for this actuator if a new teach-in operation is carried out. The disabled code is deleted again in the interlocking module only after a third code has been taught.
- The interlocking module can only be operated with the last handle module taught.
- If, in the teach-in standby state, the interlocking module detects the handle module taught-in or a disabled handle module, the teach-in standby state is ended immediately and the interlocking module changes to the normal state.
- If the bolt tongue is in the operating distance for less than 60 s, the handle module is not taught.

Tip!

A teach-in adapter (order no. 122369) is available for easier teach-in of already mounted AR devices or for device replacement. It is simply inserted between the connecting cable and the AR device. The device immediately enters teach-in operation on reconnection. After teach-in, the adapter is removed again and the MGB is connected normally. It is not necessary to fit a jumper (e.g. in the control cabinet).

Teaching in handle module

1. Fit handle module.
2. Close safety guard. Check for correct alignment and distance using the marking on the interlocking module and re-adjust if necessary.
3. Insert bolt tongue in the interlocking module.
4. Apply operating voltage to the interlocking module.

➡ The green LED (State) flashes quickly (approx. 5 Hz). A self-test is performed during this time (approx. 10 s in case of AR configuration). Teach-in operation starts, green LED (State) flashes slowly (approx. 1 Hz). During teach-in, the interlocking module checks whether the handle module is a disabled handle module. Provided this is not the case, the teach-in operation is completed after approx. 60 seconds, and the green LED (State) goes out. The new code has now been stored, and the old code is disabled.

5. To activate the handle module's code from the teach-in operation in the interlocking module, the operating voltage must then be switched off at the interlocking module for min. 3 seconds. As an alternative, 24V can be applied to the input RST for min. 3 seconds.

Teach-in in a series connection works analogously. Here, the complete series connection must be restarted using the input RST.

12.2. Mechanical function test

It must be possible to easily insert the bolt tongue in the interlocking module. To check, close safety guard several times and actuate door handle.

If available, check function of the escape release. It must be possible to operate the escape release from the inside without excessive effort (approx 40 N).

12.3. Electrical function test

AR

WARNING

On usage in a switch chain with different AR devices (e.g. CES-AR, CET-AR), also follow the procedure for the functional check in the related operating instructions.

1. Switch on operating voltage.

➡ The interlocking module carries out a self-test. In case of AR configuration: The green State LED flashes for 10 s with 5 Hz. The green State LED then flashes at regular intervals.

2. Close all safety guards and insert the bolt tongue in the interlocking module. As soon as the bolt tongue is inserted in the interlocking module, the safety outputs FO1A/FO1B are ON.

➡ The machine must not start automatically.

➡ The green State LED illuminates continuously.

3. Enable operation in the control system.
4. Open the safety guard.

➡ The machine must switch off and it must not be possible to start it as long as the safety guard is open.

Repeat steps 2-4 for each safety guard.

EN

13. Technical data

NOTICE

If a product data sheet is included with the product, the information on the data sheet applies in case of discrepancies with the operating instructions.

Parameter	Value	Unit
Housing material	Glass fiber reinforced plastic; die-cast zinc, nickel-plated; stainless steel	
Dimensions	See chapter *7.4. Dimension drawing on page 12*	
Weight Interlocking module Handle module Escape release	 0.75 1.00 0.50	kg
Ambient temperature at U_B = DC 24 V	-20 ... +55	°C
Degree of protection Cover not populated/populated with buttons/indicators/selector switches Cover populated with key-operated rotary switch Cover populated with key-operated rotary switch FS22	 IP 65 IP 54 IP 42	
Safety class	III	
Degree of contamination	3	
Installation position	Any	
Connection	4 cable entries M20x1.5 or plug connector	
Conductor cross-section (rigid/flexible) - With ferrule according to DIN 46228/1 - With ferrule with collar according to DIN 46228/1	0.13 ... 1.5 (AWG 24 ... AWG 16) 0.25 ... 1.5 0.25 ... 0.75	mm^2
Operating voltage UB (reverse polarity protected, regulated, residual ripple < 5%)	24 +10% / -15% (PELV)	V DC
Auxiliary voltage UA (reverse polarity protected, regulated, residual ripple < 5%)	24 +10% / -15% (PELV)	V DC
Current consumption I_{UB} (no load on any outputs)	80	mA
Current consumption I_{UA} - Push button S (unloaded, per LED)	 5	mA
External fuse	See chapter *11.3. Fuse protection for power supply on page 22*	
Safety outputs FO1A/FO1B	**Semiconductor outputs, p-switching, short circuit-proof**	
Test pulses	AR < 1,000/AP < 300	µs
Test pulse interval	Min. 100	ms
Output voltage U_{FO1A} / U_{FO1B} [1] HIGH U_{FO1A} / U_{FO1B} LOW U_{FO1A} / U_{FO1B}	 U_B-2V ... U_B 0 ... 1	 V DC
Switching current per safety output	1 ... 200	mA
Utilization category according to EN IEC 60947-5-2	DC-13 24 V 200 mA Caution: outputs must be protected with a free-wheeling diode in case of inductive loads.	
Monitoring outputs - Output voltage [1] - Max. load	p-switching, short circuit-proof U_A - 2V ... U_A Max. 50	 mA
Rated insulation voltage U_i	30	V
Rated impulse withstand voltage U_{imp}	1.5	kV
Resilience to vibration	In acc. with EN IEC 60947-5-3	
Switching frequency	0.25	Hz
EMC protection requirements	In acc. with EN IEC 60947-5-3	
Reliability values acc. to EN ISO 13849-1		
Category	4	
Performance Level	PL e	
PFH_d	3.7 x 10^{-9} / h [2]	
Mission time	20	years
B_{10d} (emergency stop)	0.065 x 10^6	
Emergency stop		
Operating voltage	5 ... 24	V
Operating current	1 ... 100	mA
Breaking capacity max.	250	mW
Power supply LED	24	V DC
Controls and indicators		
Operating voltage	UA	V
Operating current	1 ... 10	mA
Breaking capacity max.	250	mW
Power supply LED	24	V DC

1) Values at a switching current of 50 mA without taking into account the cable length.
2) Applying the limit value from EN ISO 13849-1:2008, section 4.5.2 (MTTFd = max. 100 years), the employers' liability insurance association certifies a PFHd of max. 2.47 x 10^{-8}.

13.1. Typical system times

Important!

The system times given are maximum values for one device.

Ready delay:

AR ***In case of AR configuration the following applies:*** After switching on, the unit carries out a self-test for 10 s. The system is ready for operation only after this time.

AP ***In case of AP configuration the following applies:*** After switching on, the unit carries out a self-test for 0.5 s. The system is ready for operation only after this time.

Switch-on time of safety outputs:

AR ***In case of AR configuration the following applies:*** The max. reaction time from the moment when the safety guard is locked to the moment when the safety outputs switch on T_{on} is 570 ms.

AP ***In case of AP configuration the following applies:*** The max. reaction time from the moment when the bolt tongue is inserted to the moment when the safety outputs switch on T_{on} is 570 ms.

AR **Simultaneity monitoring, safety inputs FI1A/FI1B:** If the safety inputs have different switching states for longer than 150 ms, the safety outputs FO1A/FO1B will be switched off. The device switches to fault state.

Risk time according to EN 60947-5-3:

If the bolt tongue is pulled out of the interlocking module, the safety outputs FO1A and FO1B are deactivated after a maximum of 350 ms.

This value applies to a single switch. For each additional switch in a chain the risk time increases by 5 ms.

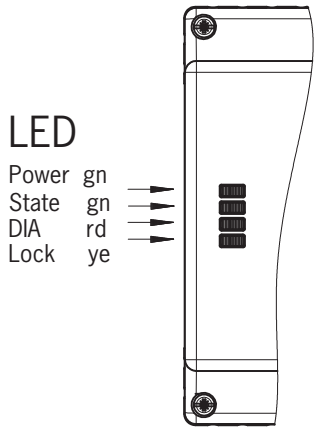
Difference time: The safety outputs FO1A and FO1B switch with a slight delay in relation to each other. They both have the ON state at the latest after a difference time of 10 ms.

Time offset: The max. permissible time offset between switch-on of operating voltage UB and auxiliary voltage UA is 1 s.

14. System states

14.1. Key to symbols

○	LED not illuminated
☀	LED illuminated
☀ 10 Hz (8 s)	LED flashes for 8 seconds at 10 Hz
☀ 3 x	LED flashes three times
X	Any state



EN

14.2. MGB-AR system status table

Operating mode		Safety outputs FI1A and FI1B	Door position	Position of the bolt tongue	Safety outputs FO1A and FO1B	Door monitoring output (OD)	Bolt tongue monitoring output (OT)	Diagnostics monitoring output (OI)	LED indicator: Power (green)	LED indicator: STATE (green)	LED indicator: DIA (red)	State
Self-test		X	X	X	OFF	OFF	OFF	OFF		5 Hz		Self-test after power up
Normal operation		X	open	not inserted	OFF	OFF	OFF	OFF		Long OFF short ON		Normal operation, door open
		X	closed	not inserted	OFF	ON	OFF	OFF		Long ON, short OFF		Normal operation, door closed
		OFF	closed	inserted	OFF	ON	ON	OFF		Long ON, short OFF		Normal operation, door closed, bolt tongue inserted safety inputs FI1A/FI1B OFF
		ON	closed	inserted	ON	ON	ON	OFF			○	Normal operation, door closed, bolt tongue inserted. Safety inputs FI1A/FI1B are ON. Safety outputs FO1A and FO1B are ON
		OFF	closed	inserted	OFF	ON	ON	OFF		Long ON, short OFF		**Operation in an AR chain:** Normal operation, door closed and locked. Safety outputs on the previous device OFF
		ON	closed	inserted	ON	ON	ON	OFF				**Operation as separate device:** Normal operation, door closed and locked.
												Operation in an AR chain: Normal operation, door closed and locked. Safety outputs on the previous device ON
Teach-in standby (only for MGB unicode)		X	open	not inserted	OFF	OFF	OFF	OFF		3 x		Door open; device is ready for teach-in of another handle module (only 3 min. after Power UP)
Setup (only for MGB unicode)		X	closed	inserted	OFF	OFF	OFF	OFF		1 Hz		Teach-in operation, tip: To prevent the interruption of teach-in operations, close door and insert bolt tongue
		X	X	X	OFF	OFF	OFF	OFF		○		Positive acknowledgment after completion of teach-in operation
Diagnostics		X	X	X	OFF	OFF	OFF	ON		1 x		Error during teach-in/configuration or invalid DIP switch setting
		errone-ous	X	X	OFF	OFF	OFF	ON		2 x		FI1A/FI1B input error (e.g. missing test pulses, illogical switching state from previous switch)
		X	X	X	OFF	X	X	OFF		3 x		Handle module read error (e.g. error in code)
		X	X	X	OFF	OFF	OFF	ON		4 x		Output fault (e.g. short circuit, loss of switching capability) or short circuit at the outputs
		X	X	X	X	OFF	OFF	ON		○		Internal fault (e.g. component faulty, data error)
		X	X	X	OFF	OFF	OFF	ON		○		Signal sequence erroneous (e.g. broken bolt tongue)

After remedying the cause, use the reset function (see chapter *15. Troubleshooting and assistance on page 36*) or briefly disconnect the power supply. Please contact the manufacturer if the fault could not be reset after restarting.
Important: If you do not find the displayed device status in the System status table, this indicates an internal device fault. In this case, you should contact the manufacturer.

14.3. MGB-AP system status table

Operating mode	Door position	Position of the bolt tongue	Safety outputs FO1A and FO1B	Door monitoring output (OD)	Bolt tongue monitoring output (OT)	Diagnostics monitoring output (OI)	LED indicator: Power (green)	LED indicator: State (green)	LED indicator: DIA (red)	State
Normal operation	open	not inserted	OFF	OFF	OFF	OFF		Long OFF short ON		Normal operation, door open
	closed	not inserted	OFF	ON	OFF	OFF		Long ON, short OFF		Normal operation, door closed
	closed	inserted	ON	ON	ON	OFF				Normal operation, door closed, bolt tongue inserted. Safety outputs FO1A and FO1B are ON
	closed	inserted	ON	ON	ON	OFF			○	Normal operation, door closed and locked.
Teach-in standby (only for MGB unicode)	open	not inserted	OFF	OFF	OFF	OFF		3 x		Door open; device is ready for teach-in of another handle module (only 3 min. after Power UP)
Setup (only for MGB unicode)	closed	inserted	OFF	OFF	OFF	OFF		1 Hz		Teach-in operation, tip: To prevent the interruption of teach-in operations, close door and insert bolt tongue
	X	X	OFF	OFF	OFF	OFF		○		Positive acknowledgment after completion of teach-in operation
Diagnostics	X	X	OFF	OFF	OFF	ON		1 x		Error during teach-in/configuration or invalid DIP switch setting
	X	X	OFF	X	X	OFF		3 x		Handle module read error (e.g. error in code)
	X	X	OFF	OFF	OFF	ON		4 x		Output fault (e.g. short circuit, loss of switching capability) or short circuit at the outputs
	X	X	X	OFF	OFF	ON		○		Internal fault (e.g. component faulty, data error)
	X	X	OFF	OFF	OFF	ON		○		Signal sequence erroneous (e.g. broken bolt tongue)

After remedying the cause, use the reset function (see chapter *15. Troubleshooting and assistance on page 36*) or briefly disconnect the power supply. Please contact the manufacturer if the fault could not be reset after restarting.
Important: If you do not find the displayed device status in the System status table, this indicates an internal device fault. In this case, you should contact the manufacturer.

EN

15. Troubleshooting and assistance

15.1. Fault reset

Proceed as follows:

1. Open the safety guard.
2. Switch off operating voltage at the interlocking module for min. 3 seconds or connect 24 V to the input RST for min. 3 seconds.
   Alternatively, the internal reset (see *7. System overview on page 11*) can be pressed for 3 seconds with a pointed object, e.g. ball-point pen.

➡ The green LED (State) flashes quickly (approx. 5 Hz in case of AR configuration). A self-test is performed during this time (approx. 10 s in case of AR configuration). The LED then cyclically flashes three times.

2. Close the safety guard.

➡ The system is in normal mode again.

15.2. Help on troubleshooting in the Internet

You will find a help file on troubleshooting under “Support” in the service area at www.euchner.de.

15.3. Help on mounting in the Internet

You will find an animation on the mounting process at www.euchner.de.

15.4. Application examples

You will find application examples on connecting the device to various control systems at www.euchner.de.

16. Service

If service support is required, please contact:

EUCHNER GmbH + Co. KG
Kohlhammerstraße 16
D-70771 Leinfelden-Echterdingen

Service telephone:

+49 711 7597-500

E-mail:

support@euchner.de

Internet:

www.euchner.de

17. Inspection and service

⚠	**WARNING** Loss of the safety function because of damage to the system. In case of damage, the affected module must be replaced completely. Only accessories or spare parts that can be ordered from EUCHNER may be replaced.

Regular inspection of the following is necessary to ensure trouble-free long-term operation:

- Check the switching function (see section *12.3. Electrical function test on page 31*)
- Check the secure fastening of the devices and the connections
- Check for soiling

No servicing is required; repairs to the device are only allowed to be made by the manufacturer.

ⓘ	**NOTICE** The year of manufacture can be seen in the lower right corner of the rating plate.

EN

18. Declaration of conformity

More than safety.

EUCHNER

EUCHNER GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen
Germany

EG-Konformitätserklärung
EC-Declaration of Conformity
CE-Déclaration de Conformité
CE-Dichiarazione di conformità
CE-Declaración de Conformidad

Original DE
Translation EN
Traduction FR
Traduzione IT
Traducción ES

123150-02-02/15

Die nachfolgend aufgeführten Produkte sind konform mit den Anforderungen der folgenden Richtlinien (falls zutreffend):
The beneath listed products are in conformity with the requirements of the following directives (if applicable):
Les produits mentionnés ci-dessous sont conformes aux exigences imposées par les directives suivantes (si valable)
I prodotti sotto elencati sono conformi alle direttive sotto riportate (dove applicabili):
Los productos listados a continuación son conforme a los requisitos de las siguientes directivas (si fueran aplicables):

I:	2006/42/EG	Maschinenrichtlinie
	2006/42/EC	*Machinery directive*
	2006/42/CE	*Directive Machines*
	2006/42/CE	*Direttiva Macchine*
	2006/42/CE	*Directiva de máquinas*
II:	2004/108/EG	EMV Richtlinie
	2004/108/EC	*EMC Directive*
	2004/108/CE	*Directive de Compatibilité électromagnétique*
	2004/108/CE	*Direttiva EMV*
	2004/108/CE	*Directiva CEM*

Die Schutzziele der Niederspannungsrichtlinie wurden gemäß Anhang I, Nr. 1.5.1 der Maschinenrichtlinie eingehalten.
The safety objectives of the Low-Voltage Directive comply with Annex I, No. 1.5.1 of the Machinery Directive.
Les objectifs de sécurité de la Directive Basse Tension sont conformes à l'annexe I, No. 1.5.1 de la Directive Machines
Gli obiettivi di sicurezza della Direttiva Bassa Tensione sono conformi a quanto riportato all'allegato I, No. 1.5.1 della Direttiva Macchine.
Los objetivos de seguridad de la Directiva de Bajo Voltaje cumplen con el Anexo I, No. 1.5.1 de la Directiva de Máquinas

Folgende Normen sind angewandt:	a:	EN 60947-5-3:1999/A1:2005
Following standards are used:	b:	EN ISO 14119:2013
Les normes suivantes sont appliquées:	c:	EN ISO 13849-1:2008
Vengono applicate le seguenti norme:	d:	EN 60947-5-5:1997/A1:2005
Se utilizan los siguientes estándares:		

Bezeichnung der Bauteile *Description of components* *Description des composants* *Descrizione dei componenti* *Descripción de componentes*	**Type** *Type* *Type* *Tipo* *Typo*	**Richtlinie** *Directives* *Directive* *Direttiva* *Directivas*	**Normen** *Standards* *Normes* *Norme* *Estándares*	**Zertifikats-Nr.** *No. of certificate* *Numéro du certificat* *Numero del certificato* *Número del certificado*
Sicherheitsschalter *Safety Switches* *Interrupteurs de sécurité* *Finecorsa di sicurezza* *Interruptores de seguridad*	MGB-L...-AR... MGB-L...-AP... MGB-H... MGB-E... MGB-C...	I, II	a, b, c	UQS 123125
Sicherheitsschalter mit Not-Halt-Einrichtungen *Safety Switches with Emergency-Stop facilities* *Interrupteurs de sécurité avec appareillage arrêt d'urgence* *Finecorsa di sicurezza con dispositivi di arresto di emergenza* *Interruptores de seguridad con dispositivos de parada de emergencia*	MGB-L...-AR... MGB-L...-AP... MGB-H... MGB-E... MGB-C...	I, II	a, b, c, d	UQS 123125

Benannte Stelle
Notified Body
Organisme notifié
Sede indicata
Entidad citada

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Leinfelden, Februar 2015

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